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Maintenance Assessment Program (MAP) Development and Implementation

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STATE DOCUMENTS

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I. Focus on the Customer

The South Carolina Department of Transportation's (SCDOT's) mission is to build and maintain roads and bridges as well as provide mass transit services to the citizens of the state. One of the most critical parts of SCDOT's mission is the maintenance of the roads and bridges. There are billions and billions of dollars that have already been invested in SCDOT's current infrastructure. It is in the best interest of the South Carolina taxpayers and SCDOT to get the most return on this financial investment. Therefore, the current highway system needs to be properly maintained to maximize its useful life. In addition to the protection of this previous investment, the maintenance of the current system affects more travelers throughout the state than the construction of new projects. Therefore, in order to find a process improvement that would affect the most customers, I am concentrating on the Maintenance Division of SCDOT.

II. Identify the Players and their Responsibilities

The Maintenance Division of the South Carolina Department of Transportation has many responsibilities. Some of these responsibilities include:

1. Pavement Maintenance
2. Vegetation Maintenance to include right-of-way mowing and limb trimming
3. Installation and maintenance of pavement markings
4. Installation and maintenance of signs

5. Barrier rail maintenance (guard rail, cable rail, barrier wall, end terminals, attenuators)
6. Maintenance of drainage structures and channels
7. Sidewalk maintenance
8. Shoulder maintenance
9. Drive way installation and maintenance (residential only)
10. Maintenance of bridges

The state's Maintenance Division consists of the Director of Maintenance office, seven district offices, and county offices. Each county office has a Resident Maintenance Engineer who is responsible for the county's maintenance responsibilities. The county Resident Maintenance Engineer is directly supervised by his District Maintenance Engineer. Each District Maintenance Engineer is responsible for their district's maintenance, with oversight from the Director of Maintenance office in Columbia, South Carolina. A breakdown occurs because there is not a direct chain of command from the Director of Maintenance to the District Maintenance Engineers. See Appendix A for an Organizational Chart that illustrates the structure of SCDOT's Maintenance Division. This lack of direct authority definitely contributes to the variance in priorities and performance of highway maintenance throughout the state.

III. Identify the Problem

The SCDOT has established guidelines and procedures for performing the aforementioned maintenance activities. The element that is missing is an established expectation of the level of service required for each maintenance function. For example,

in some areas of the state, the shoulders always seem to be wide and mowed, vegetation around guardrail kept clear, and road signs clean and straight. In other areas, the shoulders are narrow and vegetation appears to be out of control. Therefore, throughout the state, there are extreme variances of the level of service provided for these maintenance functions. This fact is verified continually during investigations of performance by Director of Maintenance staff. In addition to the unclear expectations, this variance can be attributed to many other factors that include:

1. Leadership philosophy – Due to the lack of a direct chain of command from the Director of Maintenance to the District Maintenance Engineers, and as a result of personnel changes, each district has developed their own philosophy of acceptable levels of maintenance and priorities. For example, the number of mowing cycles per year performed by maintenance unit differs greatly among the seven districts.
2. Level of urbanization/population – The level of growth and urbanization often dictate the priorities within a district. The districts with larger populations have more traffic, more requests for service, and more maintenance issues resulting from pavement fatigue failures. In general, the maintenance needs per lane mile increase as the average daily traffic increases.
3. The physical topography of the area – The physical area also plays a role in maintenance requirements. There are mountainous terrains and sea level terrains that interject their own challenges to maintenance. In addition to terrain, the type of road may have more stringent maintenance requirements.

For example, interstate highways require different levels of traffic control and response than primary or secondary roads.

4. Limited resources – The amount of resources available is also a limiting factor on the amount of work that can be accomplished. Not only are the direct resources limited (i.e. people, equipment, funds), but the secondary resources (contract maintenance) are also limited by a lack of funding.

IV. Introducing the Process Improvement

Once the areas contributing to the problem were identified, developing a process improvement became the next challenge. The first step was to identify which areas are affected by internal processes. Of the four contributing factors listed above, only two of them are controllable. The two that internal processes can influence are Leadership Philosophy and Limited Resources.

The next challenge was to develop an idea to improve the process that could affect one or both of these areas. The idea to conduct a random statistical analysis of road conditions for all maintenance units is an objective method to address this issue. This would require the development of a program that would identify what is needed to bring the entire state's level of service to a desirable level. The program would point out the substandard areas to local departments. The program would also be used to associate the maintenance needs to a respective cost. This could then be used to provide documentation to the State Legislature to help justify requests for an increase in funding.

Developing an assessment system would require that measurement standards be established to identify the desirable level of service. An objective measurement standard

would be critical to remove all subjectivity from the assessment. This program would also need to be geared toward the factors that are controllable. The factors that are controllable are the unclear expectations derived from differing leadership philosophy and resources.

V. Establishing the Maintenance Assessment Program (MAP)

A. Identify Areas to Assess

The next step was to identify the areas in maintenance that would be assessed and develop objective measurement criteria for each area. Due to the magnitude of this task, it was decided to research our sister states and see if there were any similar programs already in existence. Fortunately, North Carolina and Florida Department of Transportation had established programs. Information regarding their programs was acquired and analyzed for possible use in our new program. After extensive review, it was decided to model our program after North Carolina Department of Transportation's (NCDOT). During this process, there were numerous discussions with NCDOT collecting information on how their process was implemented and refined. This communication prevented SCDOT from running into many of the pitfalls that NCDOT had already resolved. A committee was created and composed of representatives from each of the seven districts. The committee was intended to obtain input from various field engineers as well as to provide ownership and obtain buy-in from the districts for this program.

After reviewing NCDOT's program and considering our goals, the committee decided to evaluate the following seven elements. (1) Pavement, (2)

Shoulders / Ditches, (3) Drainage Structures, (4) Roadside, (5) Signs, (6) Pavement Markings, and (7) Guardrail. A critical part of the evaluation was to determine measurement criteria and methods that were objective. In addition to being objective, it was also desirable to measure criteria that could have a specific cost associated with it. This was desirable because it was clear that a higher level of service would directly correlate with higher funding requirements. Therefore, having the ability to clearly define what could be accomplished with additional funding could become critical when presenting a request for funding increase to the Legislature.

B. Assessing the Elements

Each element was broken down in detail to determine exactly which aspects could be objectively measured. For example, within the Pavement element, several aspects were identified. Potholes, patching, pavement width, and the Pavement Quality Index (PQI) would be evaluated to calculate a score for the Pavement Element. See Table A for a list of all of the aspects identified for each element. However, identifying objective measurement criteria for these aspects was truly a challenge. On the surface, identifying a pothole appeared simple. However, when attempting to define the aspect, it became clear that there were varying opinions on how a pothole is defined, and what should be counted. In the end, threshold limits were defined for each aspect within a segment. Any defect exceeding the threshold limit would be inventoried and factored into the segment rating. Once the criteria were defined, a Maintenance Assessment Program (MAP) manual was compiled to provide instructions, information, and guidance

to raters (See Appendix B). Inspection forms were developed to assist the inspectors with the data collection.

C. Road Selection Process

After the method of assessment was finalized, we needed to decide how to select which roads should be assessed. Every road in the state highway system is inventoried by mile points. In an effort to keep the assessment program non-biased, each road is broken down into numbered segments using the mile points. A random number selection program determines the road and the segment to be inspected.

D. Implementation of MAP

A two-person inspection team was assembled to perform the assessments. In October 2003, this team began collecting data throughout the state that will be used in assessing each county's road maintenance. It has been calculated that there will need to be thirty segments from each county in order to have a statistically significant sample. This two-man team has averaged rating five segments per day.

VI. Challenges

There have been some issues that are still creating challenges. The first issue is related to whether the segments should be assessed based on expectations at the current level of funding, or should the rating reflect what could be accomplished if there was unlimited funding. After all, one of the objectives of this program is to justify and illustrate what can be accomplished with additional funding. However, the senior

management at SCDOT wants to use this Maintenance Assessment Program score as a factor in the Employee Performance Management System (EPMS) evaluation.

Therefore, SCDOT is currently using this MAP for two separate and competing uses.

A second challenging issue is deciding how to actually get the data into an easily reportable format. Many of the aspects are related in nature, but unrelated in the way it is measured. It would be difficult to compile them into a specific score. An example of this would be the Pavement Element. In the pavement element, the "Pothole" factor is simply the number of potholes; the "Patching" element is the number of square feet that needs to be patched; the "PQI" element is a rating on a scale of 1 to 5; and the "Width" element is simply the width of the pavement in feet. Therefore, developing a score for the "Pavement" element is truly a challenge. As a result of this problem, it is difficult to present the data in a very user-friendly format. This is a critical problem because presenting this data to the Legislature along with a request for increased funding is a primary objective of the MAP.

A third issue that is a challenge is data collection. The two-person team has averaged five segments per ten-hour day. At this rate, a statistically representative sample of thirty samples per county will take approximately 276 workdays, or 1.3 years. In an effort to combat the time issue and to obtain program buy-in from our district maintenance personnel, training was provided to a team from each district. At the end of this training, the district teams each evaluated a segment that had previously been inventoried. It was surprising to see the variance in the scores and the method in which data was collected. After reviewing these results, it was decided that in the interest in consistency, the team from the Director of Maintenance office would continue to collect

the data alone. However, with budget problems in state government, it is unlikely that additional staff will be dedicated to collecting this data.

VII. MAP Evaluation

Is this program cost effective? Is the benefit of having the MAP greater than the cost of the program? It is definitely too early to answer these questions. However, this analysis will be performed periodically to ensure this program remains beneficial. There are two criteria that will be used to evaluate this program.

The first criterion is simply the results of the actual inspections. The score for each element, county, and district will be charted. Then, a trend analysis will be performed to verify that the deficient scores are improving over time. If they do improve, this will substantiate our hypothesis concerning leadership philosophy. We will also be verifying that the scores become more consistent throughout the state.

The second criterion is the level of funding received for maintenance. We are aware that this criterion has many influences other than need. However, one of the goals of this program is to increase the level of funding for highway maintenance. Therefore, we will track the level of funding and attempt to determine whether the MAP contributed to any changes that may occur.

VIII. Conclusion

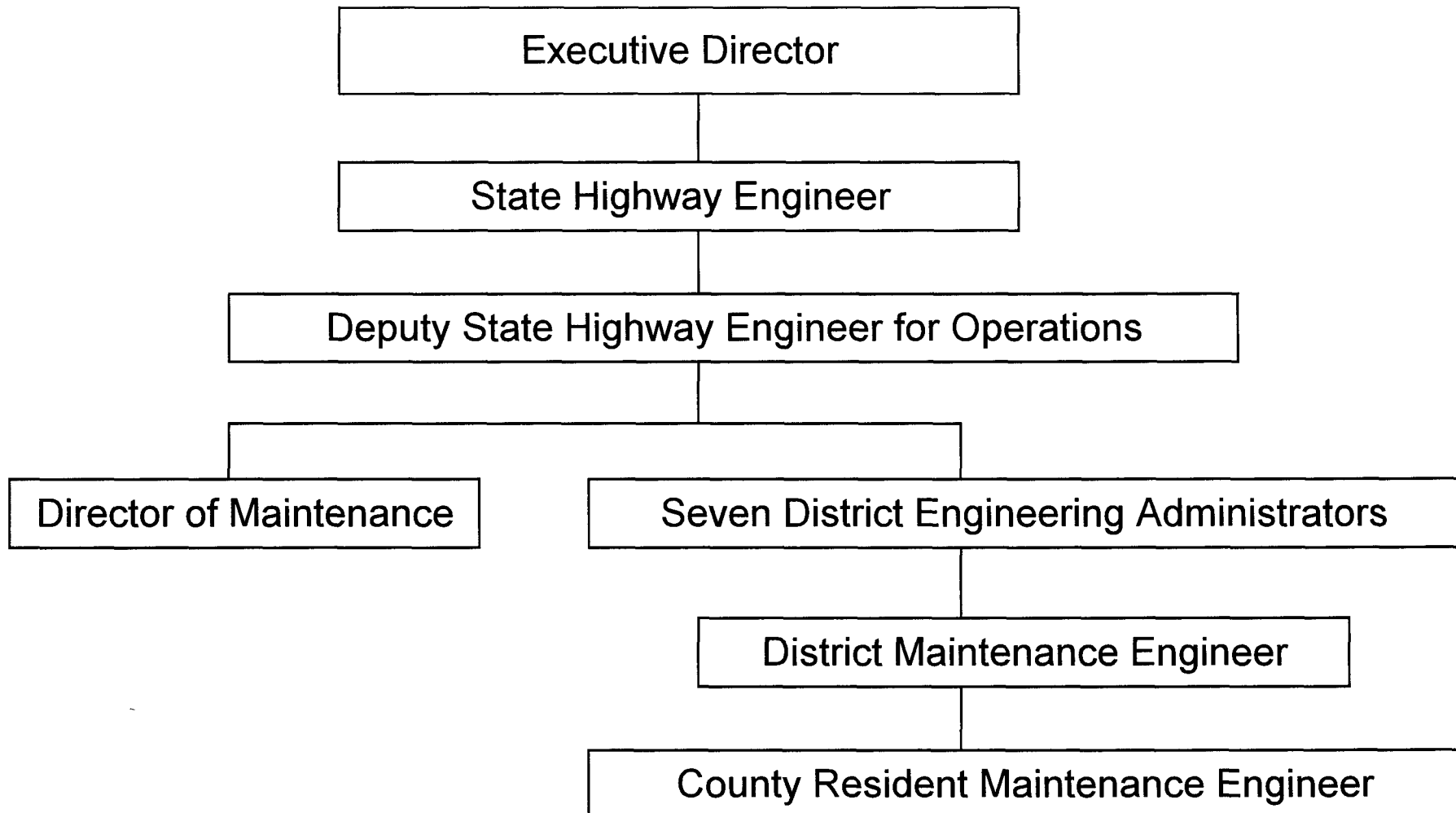
There is definitely a need to obtain an acceptable level of highway maintenance throughout the state of South Carolina. The key to accomplishing this goal is establishing clear expectations and minimum acceptable standards. The Maintenance

Assessment Program (MAP) will identify the substandard areas and instigate the reallocation of resources to the areas where they are most needed. MAP will also provide the necessary information to calculate the amount of additional resources necessary to accomplish this goal. Although there are many challenges still facing the program, there has been a lot of progress and investment to date. I am confident that acceptable solutions will be found for these challenges. As soon as the initial findings are published, South Carolina's highway maintenance needs will gain attention, focus efforts, and hopefully obtain additional funding. This will benefit the citizens throughout South Carolina as they travel by improving safety and extending the useful life of the existing highway infrastructure.

TABLE A

<u>Element 1 – Pavement</u>	
Potholes	Patching
PQI	Width
<u>Element 2 – Shoulders / Ditches</u>	
Low Shoulders	High Shoulders
Lateral Ditch Erosion	Lateral Ditches
<u>Element 3 - Drainage Structures</u>	
Crossline Pipe	Catch Basins
Driveway Pipe	Valley Gutter
Curb & Gutter	Misc. Structures
<u>Element 4 – Roadside</u>	
Brush / Tree Control	Guardrail Vegetation
Mowing	Turf Condition
Limb Height	Sidewalk
Litter Debris	Sidewalk Vegetation
<u>Element 5 – Signs</u>	
Age	Faded
Illegible	Damaged
Missing	Vandalized
<u>Element 6 – Pavement Markings</u>	
Raised Pavement Markers	
Thermoplastic Markers	
Paint	
Symbols	
<u>Element 7 – Guardrail</u>	
Guardrail	Cable Barrier
End Terminal	Attenuator

SCDOT Maintenance Division Organizational Chart



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CHAPTER 1 **Introduction**

The South Carolina Department of Transportation is responsible for a safe and efficient transportation system for the state of South Carolina. The SCDOT must protect the public's investments while insuring and maintaining desired conditions and levels of service. The focus over the last decade has changed from new construction to maintaining the highway systems that are currently in place. Due to increased work loads, limited maintenance funds, greater maintenance demands, and the public perception of the maintenance departments, the desired levels of service for state maintained roads has become harder to achieve.

Since lower levels of service have steadily been on the increase in the last few years, and because of the success of current quality management programs in North Carolina and Florida, this program is being developed to implement quality management practices for the South Carolina Department of Transportation. This manual will provide a method for collecting maintenance data in order to determine the overall condition of the state's highways. Different levels of service for various maintenance elements on South Carolina's highways will be established. These elements include pavement, shoulders – ditches, drainage structures, roadside, signs, pavement markings, and guardrail. The data recorded will help address required funding levels, areas of excessively high or low maintenance, and a strategy for prioritizing maintenance operations.

The mission of this program is to establish:

- Public perception and expectations
- Develop the funding level to meet the public's expectations
- Prioritize maintenance operations
- Achieve a uniform service level throughout the state by identifying excessively high or low areas of maintenance
- Identify areas requiring additional equipment or employee skills to improve levels of service in those areas

The Maintenance Assessment Program will eventually put the SCDOT into a proactive mindset by maintaining roads before they are beyond repair. This will lead to greater levels of service at unit costs below those that are currently experienced by the Department.

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CHAPTER 2 **CONDUCTING THE SURVEY**

The Maintenance Assessment Program has set performance standards that depict how maintenance activities are performed, the required equipment and manpower to carry out these tasks, and the projected rate of production. The data collected from this program will assess the effectiveness of the SCDOT's maintenance performance and help identify areas that need improvement.

The Director of Maintenance office will produce random samples of roads for each county to be reviewed each fiscal year. These samples are compiled by using the sampling equation on pg.21 from the NCHRP Report 422, Maintenance QA Program Implementation Manual. Of these samples, __% will be Interstate Roads, __% will be Primary Roads, and __% will be Secondary Roads. A minimum number of __ samples will be required for each type of road. In the case a county has no interstate roads, this percentage will be added to the secondary roads. Samples will be performed in each county during the fall, winter, spring and summer months of the fiscal year to insure that vegetation growth is sampled accurately.

The Maintenance Assessment Program will be conducted by the Quality Management Team. Each maintenance element will be evaluated and recorded according to the criteria developed by the performance standards. The data must be recorded accurately to assure credibility to the program. There should be no deviation from the performance standards to assure consistency.

The data collected by the team should be recorded on the data base system in a timely manner. All data should be entered completely and accurately. This will help avoid paper work back up and help assure that the information is correct.

If the randomly selected segment is under construction, the data will be recorded at the nearest location to that segment. If the segment is located along a bridge or railroad track, the bridge or railroad track will not be recorded. The segment will continue to the bridge or railroad track end, the bridge or railroad segment will be skipped, then the segment will continue beginning at the other bridge or railroad end until the two tenth of a mile segment is finished. Dirt roads will be evaluated in this program the same as a paved road. At the beginning of the survey the segment to be recorded should

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be marked with the beginning and ending mile points along with the site number. This will assure the correct segment location if the segment needs to be revisited because of data problems.

The Survey Teams first responsibility is to the safety of the pedestrians, motorist, and themselves. The team should walk together, facing traffic, on the same side of the road. The team should always be aware of the current traffic conditions. It may be necessary at times to have a safety crew from the local maintenance facility to provide flag persons, cones, signs, flashing directional arrow boards, etc.

The following is a list of equipment and supplies recommended for an efficient and safe collection of survey data:

Copy of Maintenance Assessment Program Manual

DOT approved vests

DOT rain suits

Vehicle with installed Distance Measuring Instrument / Lights

Straight –line diagram maps for the segments to be sampled

Inventory forms

Legal size writing clipboard

Pocket type calculator

Measuring wheel

50 foot long measuring tape

Paper clips

Pencils

Leveling device

Hand held optical level

Bush axe

White can of paint

First aid kit

Standard drawings for road construction

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CHAPTER 3

ELEMENT FEATURES AND CONDITIONS

This chapter provides the seven maintenance elements and the procedures that the Survey Team should follow to record the data for these elements. This data will then be evaluated to determine the overall condition of South Carolina's roadways and establish areas that need improvement in the maintenance field.

The seven elements to be evaluated are: (1) Pavement, (2) Shoulders / Ditches, (3) Drainage Structures, (4) Roadside, (5) Signs, (6) Pavement Markings, and (7) Guardrail. Each element will be evaluated for numerous features and characteristics. These features contain certain threshold conditions that are rated and recorded for the program. The elements and their features are located in Table 3.1.

The element features will be evaluated and assessed for secondary, primary, and interstates according to the criteria in this chapter. An explanation of each feature, threshold conditions of each feature, measuring techniques, and any additional instructions for each feature are located in this chapter.

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Element 1 – Pavement

Potholes	Patching
PQI	Width

Element 2 – Shoulders / Ditches

Low Shoulders	High Shoulders
Lateral Ditch Erosion	Lateral Ditches

Element 3 - Drainage Structures

Crossline Pipe	Catch Basins
Driveway Pipe	Valley Gutter
Curb & Gutter	Misc. Structures

Element 4 – Roadside

Brush / Tree Control	Guardrail Vegetation
Mowing	Turf Condition
Limb Height	Sidewalk
Litter Debris	Sidewalk Vegetation

Element 5 – Signs

Age	Faded
Illegible	Damaged
Missing	Vandalized

Element 6 – Pavement Markings

Raised Pavement Markers
Thermoplastic Markers
Paint
Symbols

Element 7 – Guardrail

Guardrail	Cable Barrier
End Terminal	Attenuator

Table 3.1 – Maintenance Elements and Features

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Element 1 – Pavement

Four features will be evaluated in this element. These features are: potholes, patching, width and PQI. For each feature, other than PQI, two count measurements will be recorded: The Total Segment Inventory of the feature and the Measured Amount that the feature exceeds the threshold condition. The PQI measurement will be taken from Pavement Management records.

Potholes

Feature Description: Potholes are steep sided holes of varying sizes in pavement resulting from localized disintegration. This deterioration of the roadway is caused by weather and traffic. A pothole can result in an unsafe recovery in the event a vehicle leaves the roadway. A pothole can also hold water that may eventually penetrate the base and subgrade and weaken the roadway.

Threshold Condition: No defect is **greater than ½ square foot in area and 1-1/2 inches deep. No pervious base is exposed** in any hole.

Total Segment Inventory: There will be no inventory of potholes in the segment to be recorded.

Measured Amount: The total amount of potholes found within the segment will be recorded.



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Patching

Feature Description: Patching needs to be performed in areas of heaving cracking, shoving, raveling, and base failure. When these features develop to the extent that safety is impaired or extensive pavement loss is imminent, corrective action should be taken.

Threshold Condition: No defect is **greater than ½ square foot in area** within the segment.

Total Segment Inventory: The total square foot area of the pavement within the segment will be recorded.

Measured Amount: The total square foot area that needs to be repaired with patching due to cracking, shoving, raveling, or base failure.

Special Instructions: Any areas that have been previously patched and are not functioning as intended should be included in the square foot area. Driveways will not be included in this section.



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PQI

Feature Description: The Pavement Quality Index is the basic measure of road condition used by Pavement Management. This index incorporates the roughness and distresses (including rutting) that occur on the surface of a road. The PQI scale ranges for 0.0 to 5.0, with 5.0 being the best. Normally, US/SC PQI's fall between 2.0 and 4.5. The chart below shows the relationship between the condition of the road and its PQI as defined for the US/SC Highway System.

Condition of Road	PQI
Very Good	3.7 to 5.0
Good	3.0 to 3.6
Fair	2.2 to 2.9
Poor	1.8 to 2.1
Very Poor	0.0 to 1.7

Threshold Condition: There will be no inventory in the segment to be recorded.

Total Segment Inventory: There will be no inventory in the segment to be recorded.

Measured Amount: The PQI rating listed for the route in the segment will be recorded.

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Width

Feature Description: South Carolina's Secondary roads have a standard minimum width of 22 feet. Primary roads have a standard minimum width of 24 feet.

Threshold Condition: The width of pavement should be noted for the evaluation.

Total Segment Inventory: There will be no inventory in the segment to be recorded.

Measured Amount: Measure the width of the pavement for secondary and primary roads. The width measurement should be evaluated a minimum of 3 times during the segment.

Special Instructions: Paved shoulders should be considered in the pavement width.

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Element 2 – Shoulders / Ditches

Two unpaved shoulder features and two ditch features will be rated. Low shoulders, high shoulders, lateral ditches, and lateral ditch erosion are to be noted. For each feature, two longitudinal measurements will be recorded: The Total Segment Inventory of the feature and the Measured Amount that the feature exceeds the threshold condition.

Low Shoulder

Feature Description: Low shoulders occur when the elevation of the unpaved shoulder is lower than the roadway edge of pavement. A low shoulder can result in an unsafe recovery in the event a vehicle leaves the roadway. A low shoulder can also hold water that may eventually penetrate the base and subgrade and weaken the roadway.

Threshold Condition: A low shoulder should be noted where the elevation difference is 2 inches below the typical roadway pavement edge design. A maximum shoulder width of 2 feet will be evaluated from the pavement edge.

Total Segment Inventory: The total length of the segment will be recorded. For example, if a typical two-lane, two-way roadway is being inspected, the total shoulder length will be 2,112 feet (0.2 mi. x 5,280 ft. x 2 shoulders). For the assessment of a divided roadway, the total shoulder length may be 4,224 feet (0.2 mi. x 5,280 ft. x 4 shoulders).

Measured Amount: Each shoulder in the segment is to be evaluated. The Measured Amount is the longitudinal length wherever a shoulder is 2 inches or lower than the roadway. Shoulders will be evaluated 2 feet beyond the pavement edge. On the report form, record the sum of the lengths of low shoulders that meet this condition.

Special Instructions: There may be an area in the segment where an unpaved shoulder does not exist due to a curb and gutter, median barrier, etc. When this occurs, the Total Segment Inventory must be reduced by this length.

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High Shoulder

Feature Description: High shoulders occur when the elevation of the unpaved shoulder is higher than that of the roadway edge of pavement. A high shoulder can restrict water drainage and result in ponding at the edge of roadway. The standing water can cause vehicle hydroplaning, and may also infiltrate the base and subgrade and weaken the roadway. The relief of ponding caused by a high shoulder may also scour the shoulder and front slope.

Threshold Condition: A high shoulder should be noted where the elevation difference is **2 inches** above the road surface, or higher. A maximum shoulder width of 2 feet will be evaluated from the pavement edge.

Total Segment Inventory: This length will be the same as the Low Shoulder Inventory.

Measured Amount: Each shoulder in the segment is to be evaluated. The Measured Amount is the longitudinal length wherever a shoulder is 2 inches or higher than the roadway. Shoulders will be evaluated up to 2 feet beyond the pavement edge. On the report form, record the sum of the lengths of high shoulders that meet this condition.

Special Instructions: See the special instruction for Low Shoulders.



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Lateral Ditches

Feature Description: Lateral ditches are trough-shaped channels oriented parallel to the roadway. Located along the roadside and in medians, these ditches are constructed to collect and disperse surface water in a controlled manner, and assist in the drawdown of ground water from the road base and subgrade, which may lead to pavement failure. The relief of ponding caused by blocked ditch may also erode downstream slopes and ditches when the water is released.

Threshold Condition: Lateral ditches that are 50% blocked or more and are not functioning properly should be noted.

Total Segment Inventory: The total lateral ditch length in the segment will be recorded. For example, if a typical two-lane, two-way roadway is being inspected, the total ditch length will be 2,112 feet (0.2 mi. x 5,280 ft. x 2 ditches). For the assessment of a divided roadway that has a single median lateral ditch, the total ditch length will be 3,168 feet (0.2 mi. x 5,280 ft. x 3 ditches).

Measured Amount: Each ditch in the segment is to be evaluated. Once the ditch's design shape is determined, check where blockage occurs that is 50% or higher from the ditch invert. When noted, measure the longitudinal length of blocked ditches that are not functioning properly and record the sum on the report form.

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Lateral Ditch Erosion

Feature Description: Because ditches are constructed to collect and disperse surface water in a controlled manner, they are often seeded and mulched to prevent erosion. A proper vegetative lining helps dissipate water flow velocities, and it prevents loss of roadbed support by stabilizing the soil. Ditch erosion can not only impact road stabilization and contaminate natural drainage areas, it can also be a safety problem for errant motorists.

Threshold Condition: An eroded lateral ditch should be noted when there is a loss of soil **1 foot** below the original ditch line, or lower. Eroded lateral ditch should also be noted where **6 inches or more of the edge ditch** line has been eroded from the original ditch line.

Total Segment Inventory: This length will be the same as the Lateral Ditches inventory.

Measured Amount: Each lateral ditch in the segment is to be evaluated. The Measured Amount is the longitudinal length wherever the ditch has eroded 1 foot or lower than the original ditch line. On the report form, record the sum of the lengths of ditch erosion that meet this condition.



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Element 3 – Drainage Structures

Seven drainage features will be rated: Crossline Pipe, Driveway Pipe, Curb and Gutter, Catch Basins, Box Culverts, Valley Gutter, and Misc. Structures.

Except for curb & gutter and valley gutter, the total number of drainage features in the segment will be noted as the Total Segment Inventory. Then, the number of these features that do not meet the threshold condition will be recorded as the Measured Amount. For curb & gutter and valley gutter, the total longitudinal length in the segment will be recorded as the Total Segment Inventory. Next, the length of the gutter blocked or damaged according to the threshold conditions will be recorded as the Measured Amount.

Crossline Pipes

Feature Description: Crossline pipes are subsurface conduits that carry water under the roadway to the natural drainage area. Designed for each location, pipes come in a variety of materials, sizes, and shapes. Crossline pipes will normally run under a roadway(s) at a perpendicular angle and begin and end in an open roadside ditch. If a blocked pipe causes ponding at the inlet and in the upstream ditch, the water can penetrate the subgrade and weaken the roadway. A restricted pipe is damaged due to cracking, joint failures, or corrosion, water infiltration and exfiltration may result in loss of fines from the subgrade, causing roadway settlement and pavement failure.

Threshold Condition: Crossline pipes that have openings 25% blocked or more, or where a pipe is damaged so that it affects the functionality of the system, should be noted.

Total Segment Inventory: The total number of crossline pipes in the segment will be recorded.

Measured Amount: If at all possible, each crossline pipe in the segment is to be evaluated. If the pipe is damaged, or either inlet or outlet are 25% blocked or more, that pipe will be recorded as a single feature that does not meet the threshold condition. On the report form, record the number of crossline pipes that are blocked or damaged.

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Special Instructions: Only crossline pipes maintained by Roadway Maintenance will be evaluated. Pipes along the lateral ditch that serve as a crossline pipe at an intersecting roadway will be evaluated. Crosslines under a roadway that connect to an inlet at both ends shall not be rated. If a pipe is partially within the segment, review the pipe as if it were within the segment. Crossline pipes will have separate entries on the report form for whether or not the feature is damaged or 25% blocked.

A table is provided following this section, listing most diameters of pipe used on the SCDOT's roadways and includes a measurement to assist in determining whether a pipe is obstructed more than the desired maintenance condition. The measurement will be taken at the deepest point of obstruction within the limits of the pipe including mitered ends. The percent of open area desired crossline and driveway pipes is listed at the top of the table. To determine the 25% closed for different size pipe diameters, look at the table below.

**Diameters of Driveway / Crossline Pipes with 25% of the diameter closed.
(Measurements are taken from the top of the pipe.)**

<u>Inside Pipe Diameter</u>	<u>25% Closed (Measured from the top)</u>
12 inches	8.4 inches
15	10.5
18	12.6
21	14.7
24	16.8
27	18.9
30	21.0
36	25.2
42	29.4
48	33.6
54	37.8
60	42.0
66	46.2
72	50.4

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South Carolina Department of Transportation Maintenance Assessment Program

Driveway Pipes

Feature Description: Driveway pipes are subsurface conduits that carry water along the roadway lateral ditch line under residential and business driveways. If a blocked pipe causes ponding in the upstream ditch, the water can penetrate the subgrade and weaken the roadway. A restricted pipe can also result in scouring and erosion at the outlet. If the pipe has extensive damage, water ponding and ditch scouring is likely to occur.

Threshold Condition: Driveway pipes that have openings 25% blocked or more, or where a pipe is damaged so that it affects the functionality of the system, should be noted.

Total Segment Inventory: The total number of driveway pipes in the segment will be recorded.

Measured Amount: If at all possible, each driveway pipe in the segment is to be evaluated. If the pipe is damaged, or either inlet or outlet are 25% blocked or more, that pipe will be recorded as a single feature that does not meet the threshold condition. On the report form, record the number of driveway pipes that are blocked or damaged.

Special Instructions: See the special instructions for Crossline Pipes. Also, lateral pipes at intersecting streets and roads will be rated as a crossline pipe, not a driveway pipe. If a pipe is partially within the segment, review the pipe as if it were within the segment. Driveway pipes will have separate entries on the report form for whether or not the feature is damaged or 25% blocked.



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Curb and Gutter / Valley Gutter

Feature Description: Curb and gutters are open drainage channels that direct the flow of water from the road surface and roadside area to a catch basin or other outlet. These gutters are usually made of concrete. An obstruction in the gutter may divert water flow onto the travel way and cause vehicle hydroplaning. If the curb and gutter is damaged, water can infiltrate the road base and weaken the roadway.

Threshold Condition: Gutters that are not functioning as designed due to an obstruction 2 inches or greater for at least 2 feet of curb length should be noted. Any damaged gutter should also be noted, such as cracking, settlement, misalignment, or deterioration. Any cracking that is $\frac{3}{4}$ inch or greater will be considered damaged.

Total Segment Inventory: The total curb and gutter length in the segment will be recorded.

Measured Amount: Each curb and gutter in the segment is to be evaluated. Measure the longitudinal length wherever a gutter is not functioning as designed due to an obstruction 2 inches or greater for at least 2 feet of the curb length, or where the gutter is damaged. Damaged curb and gutter will be recorded as the length of the damaged segment that needs to be replaced. On the report form, record the sum of the lengths of the curb and gutter that meet this condition.

Special Instructions: Blockage will not be noted if it will not obstruct water flow (grass growing in a construction joint, trash that will be flushed clean in the next storm, etc.). C&G and valley gutter will have separate entries on the report form for whether or not the feature is damaged or obstructed. Minor spalling at the construction joints will not be considered damaged.

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Catch Basins and Drop Inlets

Feature Description: Catch basins and drop inlets are the openings through which water enters an underground drainage network. They can be found in curbs, ditches, valley gutter, and at other locations that are designed to collect water runoff. If the grate of a catch basin or drop inlet is blocked, water ponding may occur at the obstructed opening. This can result in scour and erosion at an off-road structure, or vehicle hydroplaning if adjacent to the travel-way. If the structure is damaged, water can penetrate the base and weaken the roadway. Also, a damaged or missing grate is a safety hazard to motorists, bicyclists, and pedestrians.

Threshold Condition: Catch basins and drop inlets that are **25% blocked** or more, that are **damaged**, or that have **missing or broken grates** should be noted.

Total Segment Inventory: The total number of catch basins and drop inlets in the segment will be recorded.

Measured Amount: Each catch basin and drop inlet in the segment is to be evaluated. On the report form, record the number that are 25% blocked or more, damaged, or have missing or damaged grates.

Special Instructions: Catch basins and drop inlets gutter will have separate entries on the report form for whether or not the feature is damaged or 25% blocked.



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Misc. Drainage Structures

Feature Description: Other drainage features include paved ditches, flumes, piped slope drain, edge drains or shoulder drains, and other miscellaneous drainage structures that are used to enhance or control the flow of runoff or storm drain water. If these features do not perform properly, water may infiltrate the base and subgrade and weaken the roadway, uncontrolled flow can lead to shoulder scour, a backup of water may cause vehicle hydroplaning or slope failures, or the resulting runoff may even cause the failure of other adjacent drainage features.

Threshold Condition: Note these other drainage features that are 25% blocked, damaged, or not functioning as designed.

Total Segment Inventory: The total number of other drainage features in the segment will be recorded.

Measured Amount: Each drainage feature in the evaluated section is to be evaluated. On the report form, record the number of separate and distinct drainage features that are not functioning as designed.

Special Instructions: Where two drainage features are working together as a system, count them as a single occurrence in the report. For example, a piped slope drain leading to a paved flume should be noted as one feature in the Total Segment Inventory. If the piped slope drain, the paved flume, or both are not functioning as designed, one feature in the Measured Amount of drainage features will be noted. Box culverts should be included as miscellaneous drainage.

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Element 4 – Roadside

Eight roadside features will be rated: Mowing, Brush / Tree Control, Limb Height, Litter Debris, Guardrail Vegetation, Sidewalk Vegetation, Sidewalk, and Turf Condition. For Brush/Tree control, guardrail vegetation, sidewalk vegetation, sidewalk, and turf condition, two longitudinal measurements will be recorded: the Total Segment Inventory of the feature and the Measured Amount that the feature exceeds the threshold conditions. For litter debris, the number of pieces of litter in the segment that do not meet the threshold conditions will be recorded. For mowing, the average height of grass in the segment will be recorded.

Mowing

Feature Description: Grass and vegetation are mowed in order to maintain roadside aesthetics and insure the safety of motorists and pedestrians. A safe sight distance must be maintained at intersections and curves, and roadside vegetation must be controlled around signs, delineators, and guardrails.

Threshold Condition: The average height of the roadside grass in the area will be determined.

Total Segment Inventory: There will be no inventory of the mowable acres in this segment to be recorded.

Measured Amount: Measure the height of grass every 200 feet along the study area and enter the average height on the report form. Grass should be measured to the top of the seedhead.

Special Instructions: Only consider areas of normal roadside mowing when determining average grass height. Mowing within concrete medians with vegetation should be considered.

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Brush and Tree Control

Feature Description: Brush and tree control involves the removal of large vegetation for safety reasons, to maintain a roadway clear zone, and to provide adequate sight distance from side streets and driveways. Although trees are an appealing roadside feature, the presence of trees in the recovery area can be a hazard to errant motorists. A tree canopy can also be a problem if it restricts the visibility of traffic control devices (traffic signals or signs), reduces the stopping sight distance of drivers traveling the road, or limits the sight distance of drivers entering the roadway.

Threshold Condition: Except on interstates the areas outside routine mowing areas should be cut on a yearly basis from right-of-way to right-of-way. On Primary and Secondary roads this would include the areas between the limit of routine cutting and the right-of-way. No trees should be in the ditch line. If slopes are steep, (greater than 4:1), cutting would extend to the top of cut slopes within the right-of-way not to exceed 15 feet up cut slopes and 10 feet down fill slopes. Brush and Trees beyond the exceeded footage of these slopes will not be evaluated. This would also include slopes behind guardrail.

Total Segment Inventory: The total length of forested area in the segment will be recorded. For example, if a typical two-lane, two-way roadway is being inspected, the total length will be 2,112 feet (0.2 mi. x 5,280 ft. x 2 forested shoulders). If the road is wooded on just one side (the other side may be pasture), the segment length would be 1,056 feet (0.2 mi. x 5,280 ft. x 1 forested shoulder).

Measured Amount: Each forested shoulder in the segment is to be evaluated. The Measured Amount is the longitudinal distances where the brush and tree control zone is not clear. Enter the sum of these lengths on the report form.

Special Instructions: Brush and small trees within the control zone should not be noted if they would be mowed in normal mowing operations. However, if the brush and trees are so large that a tractor mower cannot mow them, then their longitudinal length should be measured.

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Litter or Debris

Feature Description: Litter is composed of trash, wastepaper, carcasses, etc. An attractive appearance contributes to the beauty of the roadside and the local area, and the presence of litter impacts the appearance of the area. Large pieces of trash (tires, sofas, washing machines) may constitute a traffic hazard, and must be removed immediately. Readily observable litter is defined as anything the size of a fist or bigger that can be easily seen by pedestrians, bicyclists, and the driving public.

Threshold Condition: Litter or debris that is fist-sized or larger will be noted.

Total Segment Inventory: There will be no inventory of litter and debris in the segment to be recorded.

Measured Amount: Record on the report form the number of pieces of litter in the studied area that are fist-sized or larger.

Special Instructions: If the evaluated section has more that 200 pieces of litter that fist-sized or larger, stop the count and enter 200 on the report form.



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Limb Height

Feature Description: Tree maintenance is performed so as to preserve roadway features in place when the road was accepted for maintenance. Trimming may also be performed to lesser heights beyond the shoulders to allow for the safe operation of equipment beneath the limbs for mowing equipment, ditch maintenance, etc. up to 10 feet. Trimming will be performed to provide a clear sight distance. Trimming of limbs is to be performed with hand tools or equipment that will leave a smooth clean cut on interstate roadways, high volume roads and in urban or developed areas. Trimming can be done by machine on rural secondary roads, to a height no greater than necessary to accommodate mowing equipment. Branches greater than 4 inches in diameter will be cut with hand tools or equipment that leaves a smooth cut.

Threshold Condition: There is no encroachment of trees, tree limbs, or vegetation lower than 18 feet on the paved surface of the roadway. There is no encroachment of trees, tree limbs, or vegetation lower than 14.5 over the shoulders.

Total Segment Inventory: The total length of the segment will be recorded.

Measured Amount: The total length of the segment is to be evaluated. Measure the longitudinal length wherever limbs, trees, or vegetation is encroaching the roadway, shoulder, or is not providing a clear sight distance for motorists. On the report form, record the sum of the lengths of the encroaching trees and limbs that meet this condition.

Special Instructions: A tree is defined as vegetation that is 6 feet or taller.

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Guardrail Vegetation

Feature Description: Undesirable vegetation shall be controlled along guardrail where necessary to provide a neat finish to other roadside vegetation control operations or where vegetation growing on the guardrail which causes visibility problems to oncoming motorists. Young trees should not be allowed to grow along the guardrail where they will become a hazard to traffic in the future.

Threshold Condition: No vegetation shall be **higher than the bottom of the steel beam rail** for standard guardrail. The guardrail shall be clear a **minimum of one foot in front of the steel beam and two feet behind the steel beam**. On cable rail, no vegetation shall be **higher than the lowest cable rail** on cable guardrail.

Total Segment Inventory: The total guardrail length in the segment will be recorded.

Measured Amount: Each section of guardrail in the test section is to be evaluated. Measure the longitudinal length of any guardrail that is not clear of undesired vegetation. On the report form, record the sum of the guardrail lengths that meet this condition.

Special Instructions: If guardrail is located back to back, (protection for bridge columns), vegetation shall be clear between the two guardrails.



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Sidewalk Vegetation

Feature Description: Undesirable vegetation shall be controlled along the sidewalk to provide a clear and safe travel way for pedestrians. Vegetation should not be allowed to grow over the sidewalk.

Threshold Condition: The longitudinal length of the sidewalk should be clear of any brush or vegetation.

Total Segment Inventory: The total sidewalk length in the segment will be recorded.

Measured Amount: Each section of sidewalk in the test section is to be evaluated. Measure the longitudinal length of any sidewalk that is not clear of undesired vegetation. On the report form, record the sum of the sidewalk lengths that meet this condition.



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Turf Condition

Feature Description: Turf cover is essential to maintaining the stability of unpaved shoulder, slopes, and ditch line. Without proper vegetation, soil erosion can lead to water infiltration and loss of roadbed support, and even contamination of natural drainage areas due to sediment loss.

Threshold Condition: Areas of **bare, dead, diseased, distressed, or weedy** turf will be noted. Any area with a density less than 70% will be recorded as distressed.

Total Segment Inventory: The total roadside length in segment will be recorded. For example, if a typical two-lane, two-way roadway is being inspected, the total roadside length will be 2,112 feet (0.2 mi. x 5,280 ft. x 2 shoulders). For the assessment of a divided roadway, the total roadside length may be 4,224 feet (0.2 mi. x 5,280 ft. x 4 shoulders).

Measured Amount: Each shoulder, slope, and ditch in the segment is to be evaluated. The Measured Amount is the longitudinal length (parallel to the roadway) of any area that has poor turf growth. On the report form, record the sum of the lengths of poor turf growth.

Special Instructions: Only the condition of turf within the normal mowing limits will be evaluated. Regraded shoulders that have not been reseeded will be listed as bare or distressed.



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Sidewalk

Feature Description: Sidewalk is an essential safety measure for pedestrians on highly traveled roadways. It provides safety to pedestrians from motor vehicles.

Threshold Condition: Areas that are **damaged or not functioning as designed**. The sidewalk area is free of **any vertical or horizontal misalignments of ½" or greater**.

Total Segment Inventory: The total square foot area of the sidewalk within the segment will be recorded.

Measured Amount: The total square foot area that needs to be repaired or areas that need handicap ramps. This area should be from construction joint to construction joint.



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Element 5 – Signs

Signs will be rated for the following: Loss of reflectivity, illegible, missing, obliterated, faded, or a service life of 10 years or more.

The total number of traffic signs in the segment will be noted as the Total Segment Inventory. Then, the number of signs that do not meet the threshold condition will be recorded as the Measured Amount.

Signs

Feature Description: Signs control traffic and convey information. The three types of traffic signs are regulatory, warning, and guide signs. Detailed sign standards can be found in the Manual on Uniform Traffic Control Devices (MUTCD). To be effective, signs must be easily visible and legible to both vehicular and pedestrian traffic. If not, the result may be motorists confusion and error.

Threshold Condition: Signs that have damage and/or vandalism, faded, missing, are illegible, or have been in service for over 10 years should be noted. Also, signs that are leaning more than 10° off plumb and signs that are covered with vegetation should be noted.

Total Segment Inventory: The total number of traffic signs in the segment will be recorded.

Measured Amount: Count the number of signs that are illegible, missing, or obliterated, or have loss of reflectivity and record on the report form.

Special Instructions: The following signs will not be included in the report: overhead signs on structures, street name signs, and non-DOT signs. If a sign does not have a date on it and if it is in good shape, do not count the sign as being over ten years old. If more than one sign is attached to a post or posts, the signs will be evaluated separately.

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Element 6 – Pavement Markings

Three pavement marking features will be rated: Pavement Striping (thermoplastic / paint), words and symbols, and raised pavement markers. For each feature, two measurements will be recorded.

Except for pavement striping, the total number of traffic control device features in the segment will be noted as the Total Segment Inventory. Then, the number of these features that do not meet the threshold condition will be recorded as the Measured Amount. For pavement striping, the total length of the center lines, edge lines, and lane lines in the test section will be recorded as the Total Segment Inventory. Next, the length of pavement striping worn, damaged, faded, or missing according to the threshold conditions will be recorded as the Measured Amount.

Pavement Striping (Thermoplastic and Paint)

Feature Description: Pavement striping markings are applied to the road surface to convey warnings or information without diverting the driver's attention from the roadway. They consist of center lines that separate traffic traveling in opposite directions, edge lines that provide an edge of pavement guide for drivers, lane lines that separate traffic traveling in the same direction, or any other striping that conveys warnings to motorists. When pavement striping is worn or missing, this important traffic control device does not guide and direct motorists as intended, may cause driver confusion, and could even direct motorists into the wrong path.

Threshold Condition: The type of pavement striping material used will be indicated. Pavement striping that is worn, missing, or obliterated should be noted.

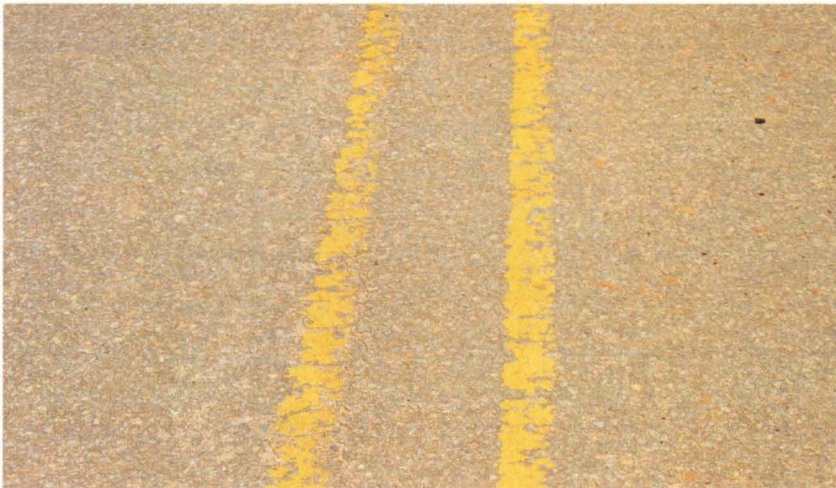
Total Segment Inventory: The total length of pavement striping in the segment will be recorded. If a typical two-lane, two-way roadway is being inspected (with edge lines and double-yellow center line), the total pavement striping length will be 4,224 feet (0.2 mi. x 5,280 ft. x 4 solid lines). If assessing a five-lane road (two through lanes each direction with a two-way left-turn lane) without curb and gutter, the total pavement marking length will be 5,280 feet (0.2 mi. x 5,280 ft. x 4 solid lines + 4 broken lines x 0.2 mi. x 5,280 ft. x 10ft./40ft).

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Measured Amount: The Measured Amount is the longitudinal length where center lines, edge lines, or lane lines are worn, missing, or obliterated. On the report form, record the type of pavement striping material and the sum of the poor pavement striping.

Special Instructions: Only the marking is to be measured. When recording broken lane lines or center lines, measure the painted marking and not the unpainted gap. For example, if rating a normal broken lane line, measure the 10-foot marking and not the 30-foot gap. If markings are not on the road, do not count them as missing, the total segment inventory and the measured amount should be zero. Markings should be 4 inches wide on secondary and primary roads and 6 inches on interstates. If the width criteria is not met, the markings should be considered worn and the threshold condition will not be met. **If 30% of the previous conditions are found then the total length of pavement striping will be included in the measured amount.**



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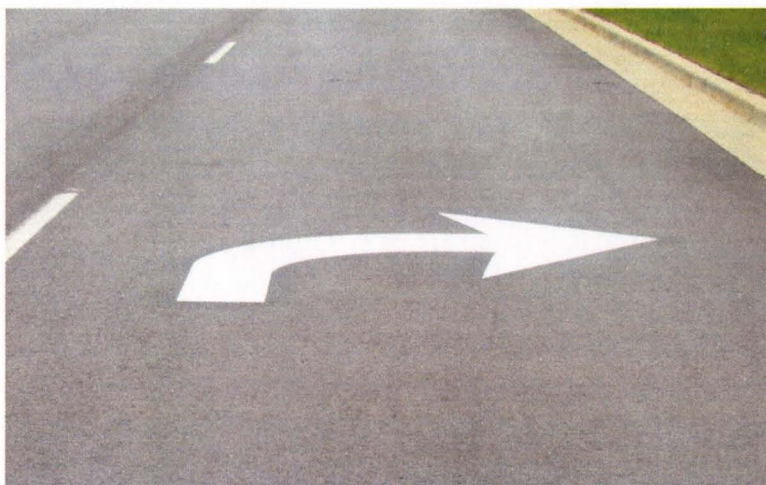
Words and Symbols

Feature Description: Words and symbols on the pavement may be used for the purpose of guiding, warning, or regulating traffic. Some examples are pavement arrows, stop bars, crosswalks, school area marking, and railroad crossing markings.

Threshold Condition: Word or symbol markings that have portions that are **worn, missing, or obliterated** should be noted.

Total Segment Inventory: The total number of word and symbol markings in the segment will be recorded.

Measured Amount: Count the number of words or symbols that are either worn, missing, or obliterated, and record on the report form.



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Raised Pavement Markings

Feature Description: Raised pavement markers may be used as positioning guides or to supplement pavement markings. These may be surface-mounted, or snowplowable. Pavement markers are normally spaced every 80 feet, except in areas of severe road curvature (horizontal curves $\geq 6^\circ$) where the spacing is 40 feet.

Threshold Condition: Pavement markers that are **damaged or missing** should be noted.

Total Segment Inventory: The total length of raised pavement markers that should be in the segment will be recorded. If a typical two-lane, two-way roadway, the number of pavement markers will be 13 (0.2 mi. x 5,280 ft./80 ft.). If assessing a five-lane road (two through lanes each direction with a two-way left-turn lane) the number of pavement markers will be 52 (4 lanes x 0.2 mi. x 5,280 ft. x 4 solid lines + 4 broken lines x 0.2 mi. x 5,280 ft. /80ft.).

Measured Amount: Count the number of pavement markers that are either damaged or missing, and record on the report form.

Special Instructions: Pavement markers will only be assessed where they have been installed. If pavement markers have not been installed in the segment being rated, both the Total Segment Inventory and the Measured Amount will be zero.



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Element 7 – Guardrail

Five guardrail features will be rated: guardrail, barrier wall, attenuators, cable barrier, and end terminals. For each feature, two measurements will be recorded.

For guardrail, barrier wall, and cable barrier, two longitudinal measurements will be recorded: the Total Segment Inventory of the feature and the Measured Amount that the feature exceeds the threshold conditions. For Attenuators and end terminals, the total number of devices that are within the segment will be recorded for the Total Segment Inventory, while the number of devices that do not meet the threshold will be recorded as the Measured Amount.

Guardrail

Feature Description: Guardrail is a safety device to protect errant motorists from hazards near the roadway. They shield roadside obstacles, protect drivers from steep drop-offs, and can even be used to separate opposing traffic. Guardrail that is not functioning properly can be as dangerous as the hazard it is meant to protect. While severely damaged guardrail needs to be repaired as soon as possible, guardrail that is only moderately damaged and still functions may be scheduled for repair later with other work. Minor damage that is only aesthetic may not need repair at all.

Threshold Condition: Guardrails that are damaged or not functioning as designed should be noted.

Total Segment Inventory: The total guardrail length in the segment will be recorded.

Measured Amount: Each section of guardrail in the test section is to be evaluated. Measure the longitudinal length of any guardrail that is not functioning as designed or has been damaged. This length should be recorded in sectional pieces of guardrail. For example, if 5 foot is damaged on a 12.5 foot section of guardrail, then 12.5 foot should be recorded as the damaged length. On the report form, record the sum of the guardrail lengths that meet this condition. If the guardrail post are leaning or damaged, then the guardrail section is considered damaged.

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Special Instructions: Do not record guardrail that is only slightly damaged and still functions as designed, or is just aesthetically displeasing.



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Attenuator

Feature Description: Attenuators are of various configurations and are designed for different roadway conditions. They are generally constructed of modules or cells containing different types of energy absorption materials. Attenuators are intended to provide a motor vehicle with a cushioned impact area prior to solid obstructions such as; parapet walls, bridge columns, sign structures, and signal poles. Any obvious malfunction, such as water or sand containers that are split, compression of the device or misalignment, causes this characteristic not to meet the desired maintenance condition.

Threshold Condition: Attenuators that are **damaged, or not functioning as designed** should be noted.

Total Segment Inventory: The total number of attenuators in the segment will be recorded.

Measured Amount: The Measured Amount is the total number of attenuators that needs to be repaired or replaced in order to function properly.

Special Instructions: Do not record attenuators that are only slightly damaged and still functions as designed, or are just aesthetically unpleasing.



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Cable Barrier

Feature Description: Cable guardrail is a safety device to protect errant motorists from hazards near the roadway. They shield roadside obstacles, protect drivers from steep drop-offs, and can even be used to separate opposing traffic. The effectiveness of cable guardrail is extremely sensitive to the height of the cable. Continuous surveillance must be made for structural integrity, height, and alignment. Damaged cable guardrail needs to be repaired as soon as possible.

Threshold Condition: Guardrails that are **damaged or not functioning as designed** should be noted.

Total Segment Inventory: The total guardrail length in the segment will be recorded.

Measured Amount: The Measured Amount is the total length of cable guardrail that needs to be replaced in order for the cable guardrail to function as it was designed.



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End Terminal

Feature Description: End terminals are intended to provide a motor vehicle with a cushioned impact area prior to solid obstructions such as; parapet walls, bridge columns, sign structures, and signal poles. End terminals are usually used at the end of a guardrail section. These terminals are usually facing traffic.

Threshold Condition: End Terminals that are **damaged, or not functioning as designed** should be noted.

Total Segment Inventory: The total number of end terminals in the segment will be recorded.

Measured Amount: The Measured Amount is the total number of end terminals that needs to be replaced in order to function properly.

Special Instructions: Do not record end terminals that are only slightly damaged and still functions as designed, or are just aesthetically unpleasing.



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South Carolina Department of Transportation Maintenance Assessment Program

Reporting Survey Data

The information collected during the Maintenance Assessment Program will be recorded on the report form shown on the following page. Location information will include a site number (which is unique to the segment being inspected), the beginning and ending mile points, county and road number, and the number of lanes. The date of the survey and the names of those conducting the survey must also be provided on the form.

It is important that the report form be filled out with a pencil. Be sure to write as neatly and legibly as possible. If a feature does not exist in the segment (for example, there may be no guardrail), enter "0" in both the inventory and Condition blocks.

Follow-up visits will be made while the survey is being conducted. This will assist the raters by clearing up questions and problems that may arise. Any remarks about the survey can also be made on the back of the form. If a concern needs to be addressed, write "OVER" on the bottom of the inventory form then relay the problem on the back. When this is done, duplicate the site number with the note in case the pages become separated.

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Maintenance Assessment Program

Date	District	Org. County	Type	Route	Aux	Begin MP	End MP	# of Travel Lanes
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Team Members

Element 1 - Pavement

CONDITION

Potholes - Total found within segment

 EA

Patching - Total found within segment

 SF

Width - Width of roadway

 LF

PQI - PQI Rating

Element 2 - Shoulders / Ditches

INVENTORY

CONDITION

Shoulders

 LF

Low Shoulders Low \geq 2"

 LF

High Shoulders High \geq 2"

 LF

Lateral Ditches

 LF

Blocked \geq 50% and Not functioning as designed

 LF

Ditch Erosion Eroded \geq 1'

 LF

Element 3 - Drainage Structures

INVENTORY

CONDITION

Crossline Pipe

 EA

Blocked \geq 25%
Damaged, or not functioning as designed

 EA

 EA

Driveway Pipe

 EA

Blocked \geq 25%
Damaged, or not functioning as designed

 EA

 EA

Curb and Gutter / Valley Gutter

 LF

Blocked \geq 2" x 2',
Damaged, or not functioning as designed

 LF

 LF

Catch Basins and Drop inlets

 EA

Blocked \geq 25%
Damaged, or not functioning as designed

 EA

 EA

Misc. Drainage Structures

 EA

Damaged, or not functioning as designed

 EA

Element 4 - Roadside

INVENTORY	CONDITION
Mowing	Average Grass Height
Brush & Tree Control	Within construction limits or ROW
Litter & Debris	# of Pieces \geq Fist - Sized
Limb Height	Within 18' above roadway and 14.5' above grassed shoulder
Guardrail Vegetation	No higher than bottom rail
Sidewalk Vegetation	Minimum of 4 foot width of sidewalk
Turf Condition	Bare, Dead, Diseased, Distressed, or Woody
Sidewalk	Damaged, or not functioning as designed

Element 5 - Signs

INVENTORY	CONDITION
Signs	Loss of Reflectivity, illegible, missing, damaged, visible, obliterated, or in service
	Leaning more than 10 degrees off plumb or covered with vegetation

Notes or Comments:

Element 6 - Pavement Markings

INVENTORY	CONDITION
Pavement Striping	
Paint	Worn, Missing, Obliterated
Thermoplastic	Worn, Missing, Obliterated
Words & Symbols	Worn, Missing, Obliterated
Raised Pavement Markers	Damaged or Missing

Element 7 - Guardrail

INVENTORY	CONDITION
Guardrail	Damaged, or not functioning as designed
End Terminal	Damaged, or not functioning as designed
Attenuator	Damaged, or not functioning as designed
Cable Barrier	Damaged, or not functioning as designed